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only a careful comparison would distinguish one from the other.

These various remains of *Pithecanthropus* were again described in detail and compared with allied forms by Dr. Dubois in his paper at Leyden, and in the discussion that followed the whole subject was once more gone over by anthropologists, zoölogists and geologists in a most thorough and judicial manner. To attempt to weigh impartially the evidence as to the nature of *Pithecanthropus*, presented by Dr. Dubois in his paper and by those who took part in the critical discussion that followed its reading, would lead far beyond the limits



FIG. 4.—Third right upper molar of *Pithecanthropus erectus*, ♂. (After Dubois.)
a, back view; b, top view.

of the present communication. I can only say that this evidence was strongly in favor of the view that the skull of *Pithecanthropus* is not human, as the orbital and nuchal regions show, while at the same time it indicates an animal much above any anthropoid ape now known, living or extinct. Opinions differed as to whether the various remains pertained to the same individual, but no one doubted their importance.

The varied opinions expressed in regard to the anatomical characters of each of the specimens have already been published, and need not be repeated here. Dr. Dubois, in his papers above cited, has met all the principal objections made to his views since he announced his discovery. He has also given full reference to the literature, which promises to be voluminous as the importance of the subject becomes better known.

After a careful study of all the *Pithecan-*

thropus remains and of the evidence presented as to the original discovery, the position in which the remains were found, and the associated fossils, my own conclusions may be briefly stated as follows:

(1) The remains of *Pithecanthropus* at present known are of Pliocene age, and the associated vertebrate fauna resembles that of the Siwalik Hills of India.

(2) The various specimens of *Pithecanthropus* apparently belonged to one individual.

(3) This individual was not human, but represented a form intermediate between man and the higher apes.

If it be true, as some have contended, that the different remains had no connection with each other, this simply proves that Dr. Dubois has made several important discoveries instead of one. All the remains are certainly anthropoid, and if any of them are human the antiquity of man extends back into the Tertiary, and his affinities with the higher apes become much nearer than has hitherto been supposed. One thing is certain: the discovery of *Pithecanthropus* is an event of the first importance to the scientific world.

O. C. MARSH.

THE METRIC SYSTEM.

THE issue of SCIENCE for May 15th contains the report of a meeting of the Engineers' Club of Philadelphia, at which, by a vote of 100 to 60, the Club urges upon Congress the adoption of the metric system as the only legal standard in the United States, and the promotion of such international coöperation as will provide unity of practice among commercial nations.

In connection with this it may be of interest to note the issue of a circular entitled 'Should the metric weights and measures be made compulsory?' It is signed by J. Emerson Dowson, of London, who is a member of the Institute of Civil Engineers and Chairman of the Executive Committee

of the New Decimal Association in England. This circular has been sent to various members of the American Society of Civil Engineers.

Mr. Dowson begins by quoting the now well-known recommendations of the Select Committee of the House of Commons, reported last July, in which it was urged that the metric system be at once legalized in England; that it be taught in all public elementary schools, and that it be rendered compulsory by act of Parliament after a lapse of two years. He discusses the reply of Mr. Balfour to the deputation of the Chamber of Commerce, who had urged upon him the need of giving effect to the recommendations of the Select Committee. Mr. Balfour expressed his high opinion of the merits of the metric system, but was unwilling that this should be made compulsory in the near future, because he feared the effect on the small retail dealers and those who buy their goods from such dealers, and thought that so important a change could not be well undertaken until public opinion is better prepared for it than at present. The metric system was legalized in America nearly twenty years ago, but in England its use is forbidden, under penalty, for purposes of trade. With us the pound and yard are defined as certain decimal fractions of the kilogram and meter, respectively, but neither legalization nor definitions are sufficient to secure general adoption until the people feel the need of discarding the inconsistencies and inconveniences to which they have become accustomed in the use of English weights and measures. Mr. Dowson's circular shows that among the plain business people of England there is an unexpectedly widespread demand for the change, in relation to which Mr. Balfour has shown himself so conservative. Soon after Mr. Balfour's reply had been given to the Deputation, the Metropolitan Grocers' and Provision Deal-

ers' Association, a body composed chiefly of retailers, had a general meeting, discussed the metric system fully and critically, and passed a resolution, amidst applause, "That after due notice the system be made compulsory after two years." The Trades Councils throughout England seem to have taken a lively interest in the question. "At several of their meetings it had been discussed in a practical way; and at a Congress held in Glasgow, where there were 495 delegates, representing about a million and a quarter members and 418 different trades, a resolution in favor of the proposed change was carried unanimously, and the Parliamentary Committee was instructed to give it active support. These Trade Councils represented bargemen and watermen, dockers, street masons and pavers, gas workers and laborers, boot and shoe workers, lithographic printers, carmen, shop assistants, railway servants and many provincial trades." "The Incorporated Society of Inspectors of Weights and Measures have passed a strong resolution in favor of the proposed change. This Society represents the inspectors from all parts of the Kingdom and they have an intimate knowledge of what is best for the retail trades." "The County Council of Durham, representing a population of 750,000, voted unanimously in favor of the change; and one notable feature is that on this Council there are twenty working miners."

Mr. Dowson's circular is accompanied by a list of public bodies, associations, etc., which have approved the adoption of the metric system in England. This list is surprisingly large, and represents an amount of strength in behalf of progress much beyond what most of us Americans have credited to the conservative English. There are 20 town councils; 40 trade councils, including the London Association for the Protection of Trade, consisting of 4,000 members, the Edinburgh Merchants' Asso-

ciation, the Association of Trade Protection Societies, the Liverpool Cotton Association, Corn Trade Association, etc.; 29 School Boards, including those of London, Manchester and Birmingham; 39 Chambers of Commerce, including those of London, Edinburgh, Liverpool, Birmingham and Belfast; and 15 other influential bodies not easily classified, such as the National Union of Teachers, the Scottish Chamber of Agriculture, the Institution of Engineers and Shipbuilders, etc. Approval of the compulsory adoption of the metric system was carried at the Congress of Chambers of Commerce of the Empire, and at the recent annual meeting of the Association of Chambers of Commerce (March 25, 1896), when the Earl of Dudley assured the meeting that the London Board of Trade, of which he is Parliamentary Secretary, "realized the importance of the question and was determined to press it to an issue as soon as possible."

Apart from the inconvenience involved in change of any kind, the only really serious objection to the general adoption of the metric system is found in the great expense that is brought into large manufacturing establishments by a change of standards. The English are beginning to appreciate the loss they are suffering by lack of harmony with most other European nations, and loss of trade soon teaches what expense may be afforded in changing standards. The facts brought out in Mr. Dowson's circular seem to show that in England at present the popular demand for the metric system is greater than it is in America, although as a people we are less conservative than the English. Despite the temporary discouragement lately suffered by the advocates of progress in metrology, the outlook among English-speaking peoples is, on the whole, far better than it has ever been in previous years; and without being unreasonably sanguine there is yet good ground

for the expectation that in both England and America the metric system will have been adopted by popular demand with the opening of the twentieth century.

Lord Kelvin's letter to the *London Times*, quoted in the last issue of SCIENCE, deals with this subject in a spirit eminently characteristic of its author and worthy of special commendation to American legislators. It thoroughly disposes of Mr. Balfour's consideration that the introduction of the metric system would bring hardship upon the poorer classes, "who have no great power to make their voices heard, at least in such discussions as these." Any argument based on the interests of these classes in England is equally applicable in America or in Germany. Those of us who have dwelt some time in Germany have noticed how thoroughly the poorer classes have adapted themselves to the metric system. There is certainly no record of their having suffered any unreasonable hardship. Indeed this is the old argument against the introduction of all labor-saving devices. If it had prevailed we should not to-day be using the power loom, the cotton gin, the steam engine or the printing press, because each of these threw some of the poorer classes out of employment, or necessitated inconvenient change of employment for them.

In the present case, moreover, there is no special need that the poorer classes should 'make their voices heard.' To form any opinion upon the merits of the metric system it is necessary to have some knowledge of it practically. Any one who has such knowledge, if he belongs to the poorer classes, should be accorded the opportunity to be heard. In America every one, however poor he may be, has access to the public ear through the daily press if he has the ability to write intelligibly. But the poor and the uneducated cannot be expected to take any active part in discussions of this kind, any more than in the founding of

universities or the establishment of monetary systems. If we wait for them to speak out we must wait indefinitely. If the introduction of the metric system be accomplished in America we must act in the light of experience already acquired in Europe, which is far more valuable than any amount of theorizing about the apprehended effect upon poorer classes who have not yet tried it.

The suggestion that an International Commission should be appointed to secure unity of action between the United States and Great Britain is eminently worthy of adoption. Any system of metrology adopted by one of these two nations must necessarily be adopted nearly, if not quite, simultaneously by the other. It is very much to be desired that this proposition shall be brought before Congress as soon as the Committee on Coinage, Weights and Measures is again ready to act.

W. LE CONTE STEVENS.

TWO EROSION EPOCHS—ANOTHER SUGGESTION.

HERSHEY's recent suggestion (*SCIENCE*, Vol. III., pp. 620-622) that a specific designation be given to the epoch of post-Lafayette erosion in the eastern United States is an excellent one. The epoch is one of the most clearly defined in the physical history of the continent; its record has already been interpreted over a vast area, and a specific designation will tend at once to crystallize knowledge and to aid in its diffusion. So the suggestion marks an advance in systematizing American geology.

To the writer the name selected seems hardly a happy one, partly because 'Ozark' is already in so general use in geologic nomenclature as perhaps to occasion confusion, partly because there is a certain incongruity in applying the name of a mountain region to a degradation period; but this question of fitness in name gives no occa-

sion for hesitating to adopt the suggestion.

There is a graver question concerning the age of the epoch. Hershey intimates, without argument, that there is 'general agreement * * * that the post-Lafayette period of erosion is early Quaternary in age;' but, so far as the writer is aware, most students have connected the degradation period with the preceding aggradation period—those geologists who have examined the formation and its degradation record (with perhaps two exceptions) regarding both as pre-Quaternary, and those who have written voluminously on the formation without seeing it regarding it as Quaternary. It seems worth while to direct attention to this question of age, partly for the purpose of pointing out that there is no less need for the term even if the epoch does not belong to the Pleistocene, and thus to the period so well classified by Chamberlin; it is not absolutely necessary to decide whether the Ozarkian epoch be classified as Pleistocene or Neocene, since each student can arrange his pigeon holes and their contents as he pleases, and since increasing knowledge is constantly making toward better arrangements; but it is important that this well-marked erosion epoch should bear a denotive label. It is also important to remember that, if erosion be regarded as yielding a time measure, the reference of the Ozarkian to the Pleistocene multiplies many times the commonly recognized duration of that period.

Hershey adequately recognizes the extent of the erosion affected during the Ozarkian epoch in (a) the Coastal plain of the Atlantic and Gulf, and (b) the broad area extending thence to the glacial margin; but it seems desirable to recognize (hypothetically perhaps, but with constantly increasing evidence), the record of the epoch in (c) the glaciated region: In the Coastal plain this epoch of profound erosion is recorded in estuaries hundreds of miles in length and